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Investigation of the Dirac states in a topological insulator, Bi(2)Se(3) DEEPNARAYAN BISWAS, SANGEETA THAKUR, KHADIZA ALI, Tata Institute of Fundamental Research, G. BALAKRISHNAN, University of Warwick, KALOBARAN MAITI, Tata Institute of Fundamental Research — Topological insulators are bulk insulators with metallic surface states protected by time reversal symmetry. These surface states are spin-polarized, backscattering free and exhibit Dirac cone in their energy band structure, and thus are potential candidates for technological advances and realizing exotic phenomena. However, experiments show appearance of such topological order on the surface of metallic bulk and instability of the Dirac states in most of the materials studied. Thus, doping foreign elements to engineer the electronic states and get access to the surface states has become an outstanding problem. We studied the detailed electronic structure of Bi2Se3 using ARPES and DFT calculations and observe different behavior for different surface terminations. Se terminated surface exhibits an electron doping scenario with aging in contrast to the hole doped scenario in Bi terminated surface. The Dirac cone on Bi terminated surface is found to be most stable even in presence of impurities and is most suitable to engineer topological insulators. In addition, we observe that the Dirac cone has strong contribution from interface states between top two quintuple layers. All these results provide an insight of the emergence of topological order on real materials.

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